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CLAIMS

WHAT IS CLAIMED IS:

- 1 1. A stabilized dual zeolite low coke forming single particle catalyst, bonded with
- 2 silica alumina binder, suitable for cracking heavy residual hydrocarbon feeds and having
- 3 enhanced hydrothermal stability, said catalyst comprising:
- 4 (a) stabilized high silica zeolite in the range of 1 wt% to 50 wt%;
- 5 (b) low silica molecular sieve in the range of 1 wt% to 40 wt%;
- 6 (c) silica in the range of 1 wt% to 15 wt%;
- 7 (d) alumina in the range of 5 wt% to 30 wt%; and
- 8 (e) clay in the range of 10 wt% to 50wt%;
- 1 2. A catalyst according to claim 1 wherein the stabilized high silica zeolite
- 2 consisting of:
 - (a) a phosphate source in the range of 1 wt% to 40 wt%;
 - (b) high silica zeolite in the range of 5 wt% to 99 wt%; and
 - (c) clay in the range of 0 wt% to 50 wt%.
- 1 3. A catalyst according to claims 1 and 2 wherein the clay is selected from the group consisting of kaolin and halloysite.
- 1 4. A catalyst according to claim 1 wherein the high silica zeolite is selected from the
- 2 group consisting of ZSM-5, ZSM-11, ZSM-12, ZSM-23, ZSM-35, ZSM-38, ZSM-48, ZSM-57,
- 3 Zeolite beta, mordenite and preferably ZSM-5.
- 1 5. A catalyst according to claim 1 wherein the low silica molecular sieve is selected
- 2 from the group consisting of faujasite, mordenite, beta, MCM mesoporous zeolite and L.
- 1 6. A catalyst according to claim 1 wherein the low silica molecular sieve is 2 exchanged with NH₃.
- 1 7. A catalyst according to claim1 wherein the low silica molecular sieve is
- 2 exchanged with rare earth cations selected from the group consisting of lanthanum, cerium,
- 3 praseodymium, neodymium, samarium and gadolinium.

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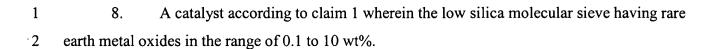
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- 9. A catalyst according to claim 1 wherein the phosphate source is selected from the group consisting of phosphoric acid, ammonium di hydrogen phosphate, ammonium mono hydrogen phosphate, tri-ammonium phosphate, ammonium hypophosphate, ammonium ortho phosphate, ammonium di hydrogen ortho-phosphate, ammonium mono hydrogen ortho-phosphate, ammonium hypophosphite, ammonium di hydrogen ortho-phosphite or a mixture thereof.
- 1 10. A catalyst according to claim 1 wherein the alumina is a pseudoboehmite having a crystal size ranging from about 3 nm to 30 nm.
 - 11. A catalyst according to claim 1 wherein the silica is in colloidal form of particles having a mean diameter ranging from about 4 nm to 30 nm.
 - 12. A catalyst according to claim 1 wherein the stabilized high silica zeolite has silica to alumina ratio from 10 to 300.
 - 13. A catalyst according to claim 1 wherein the silica alumina binder is a reaction product of acidified colloidal silica and acidified pseudoboehmite alumina.
 - 14. A catalyst according to claim 1 wherein the organic acid used for acidifying colloidal silica is selected from the group consisting of nitric acid, hydrochloric acid, formic acid and acetic acid.
- 1 15. A catalyst according to claim 1 wherein the organic acid used for acidifying 2 pseudoboehmite alumina is selected from the group consisting of acetic acid, formic acid, nitric 3 acid and hydrochloric acid or a mixture thereof.
- 1 16. A catalyst according to claim 1 wherein said catalyst produces gasoline having 2 Research Octane Number (RON) 92-93.

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1 17. A catalyst according to claim 1 wherein the particle size of the catalyst is the 2 range of 20-150 microns. 1 18. A catalyst according to claim 1 wherein the particle size of the catalyst is in the 2 range of 30-100 microns. 1 19. A catalyst according to claim 1 wherein said catalyst having reduced coke 2 formation property in the range of 12.99 –12 wt%. 20. A process for preparing hydrocarbon conversion, stabilized dual zeolite catalyst, 1 2 comprising essentially of stabilized high silica zeolite and a low silica molecular sieve, said 3 process comprising the steps of: loading high silica zeolite into a reactor and maintaining the zeolite at a (a) temperature ranging between 100-125°C for about 30 minutes; heating the high silica zeolite to a temperature in the range of 450-500°C for about (b) 7 90 minutes in nitrogen atmosphere; (c) holding the zeolite at about 450-600°C for about 90 minutes in an atmosphere steam containing phosphate; cooling the zeolite to obtain stabilized high silica zeolite; (d) treating an alumina with a dilute organic acid and gelling it for about 10 minutes (e) to obtain alumina binder; adding demineralised water to the gel alumina to make the alumina binder free 13 (f) 14 flowing; 15 adding acidified ammonium polysilicate to the gel alumina; (g) 16 adding milled clay slurry to the product of step(h); (h) 17 (i) adding milled slurry of low silica molecular sieve; 18 (i) adding demineralised water to obtain silica-alumina-clay- low silica molecular 19 sieve slurry;

alumina-clay-low silica molecular sieve slurry of step (j); and

adding the stabilized high silica zeolite as obtained in step (d) to the silica-

spray-drying the slurry and calcining the same to obtain the stabilized dual zeolite

(k)

(1)

catalyst.

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thereof.



- 21. A process according to claim 20 stabilization of high silica zeolite can be optionally performed in the following steps:
- (a) preparing phosphate-clay slurry using a phosphate source and a clay with demineralised water;
 - (b) adding high silica zeolite to the slurry;
- 6 (c) drying the product at a temperature in the range of 60-120°C in an oven; and
- 7 (d) pulverizing the product followed by calcination at about 400-600°C to obtain 8 stabilized high silica zeolite;
 - 22. A process according to claim 20 wherein the stabilized high silica zeolite has silica to alumina ratio from 10 to 300.
 - 23. A process according to claim 20 wherein the high silica zeolite is selected from the group consisting of ZSM-5, ZSM-11, ZSM-12, ZSM-23, ZSM-35, ZSM-38, ZSM-48, ZSM-57, Zeolite beta, mordenite and preferably ZSM-5.
 - 24. A process according to claim 20 wherein the stabilized high silica zeolite contains optionally clay selected from the group consisting of kaolin and halloysite.
 - 25. A process according to claim 20 wherein the phosphate source is selected from the group consisting of phosphoric acid, ammonium di hydrogen phosphate, ammonium mono hydrogen phosphate, tri-ammonium phosphate, ammonium hypophosphate, ammonium ortho phosphate, ammonium di hydrogen ortho-phosphate, ammonium hypophosphite or a mixture
- 1 26. A process according to claim 20 wherein the colloidal silica sol has a pH between 2 7.0 and 11.5.
- 1 27. A process according to claim 20 wherein the colloidal silica consists of silica 2 particles having a mean diameter ranging from about 4 nm to 30 nm.
- 1 28. A process according to claim 20 wherein the colloidal silica contains soda in the 2 range of from 0.01 to 0.20 wt%.

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- 1 29. A process according to claim 20 wherein said silica sol is acidified to a pH 2 between 0.5 and 3.5 before use.
- 1 30. A process according to claim 20 wherein said silica sol is acidified using a acid selected from group consisting of nitric acid, hydrochloric acid, formic acid and acetic acid.
- 1 31. A process according to claim 20 wherein said alumina is a pseudoboehmite.
- 1 32. A process according to claim 20 wherein said alumina has crystallite size ranging from about 3 nm to about 30 nm.
 - 33. A process according to claim 20 wherein said alumina has soda content ranging between 0.001 and 0.1 wt%.
 - 34. A process according to claim 20 wherein the alumina used is acidified using acids selected from the group consisting of acetic acid, formic acid, nitric acid and hydrochloric acid or a mixture thereof.
 - 35. A process according to claim 20 wherein ratio of high silica zeolite to low silica molecular sieve is in the range of 1-50:1-40.